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## PSYCHOPHYSIOLOGICAL REACTIVITY IN PEDIATRIC MIGRAINE PATIENTS AND HEALTHY CONTROLS

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**Abstract**—The hypothesis that physiological responses of migraine patients are symptom-specific was evaluated in 29 children (age range 8–16 years) suffering from migraine and 10 healthy control children. The assessment included two major stress phases and a relaxation period. A standard laboratory stressor (a subtraction task) and parent–child conflict served as stressors. A total of six physiological parameters were measured: pulse amplitude at two extracranial (A. temporalis, A. supraorbitalis) and one peripheral (index finger) sites; finger temperature; heart rate; and skin-conductance level. There were no significant group differences in autonomic arousal. Moreover, extracranial and peripheral vasomotor activity was not different between groups, a finding which might be partially due to the considerable interindividual variability. The implications of the results are discussed taking into account that studying pediatric rather than adult migraine patients allows to minimize the potentially confounding impact of factors such as headache chronicity, medication, and additional nonmigraine headaches. © 1998 Elsevier Science Inc.

**Keywords:** Finger temperature; Heart rate; Pediatric migraine; Skin conductance level; Symptom specificity; Vasomotor responses.

### INTRODUCTION

In contrast to earlier models, which typically postulated a primary vascular dysfunction [1] or neurological disturbance (e.g., ref. 2) as the underlying cause of migraine, recent models of migraine pathophysiology posit that a migraine attack is the result of a complex interplay between neural, vascular and myofascial events (e.g., refs. 3 and 4). It is assumed that neurovascular sensitivity to physical (e.g., exposure to light) and emotional stressors plays a central role in the proneness to recurrent migraine attacks [4, 5]. This claim is consistent with the clinical observation that adult and child migraine patients perceive “stress” as one of the most important migraine triggers (e.g., refs. 6–8). Yet, it is less clear to what extent migraine patients exhibit a specific psychophysiological response pattern that would be indicative of the presumed neurovascular sensitivity (cf. ref. 9).

Migraine patients have, in general, although not consistently (e.g., ref. 10), been shown to respond with a more pronounced vasodilation of the A. temporalis when

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exposed to aversive noise [11, 12], stress imagery [13], and reaction time tasks [14, 15], or when attempting to relax [16]. However, differences in stress-induced changes in heart rate, skin conductance, and finger temperature between migraine patients and control subjects have rarely been demonstrated [15, 17]. In contrast to the data on stress-induced reactivity, there is little evidence to support the hypothesis of significant baseline differences in sympathetic arousal and vasomotor functioning between migraine patients and control subjects (e.g., refs. 13, 14, 18–21). Only a small proportion of studies has specifically evaluated the recovery of psychophysiological responses. Whereas some studies have reported a delayed recovery of vasomotor activity [13, 14, 22], other studies have failed to replicate these findings [18, 19, 23]. By contrast, there seems to be some consensus that indices of general arousal (i.e., heart rate or skin conductance) or indirect measures of peripheral vasoactivity (i.e., peripheral temperature) do not differ in their return to baseline between migraine and control subjects [13, 24, 25].

It cannot be ruled out that the inconsistent results might be a consequence of methodological and conceptual weaknesses (for a comprehensive review see ref. 26). Assessing children with migraine not only minimizes the confounding effects of chronic headaches (HA) and long-term use of medication (especially vasoactive drugs), but the findings are also less likely to be influenced by the (largely unknown) effects of recurrent episodes of tension-type HA and the psychological sequelae of chronic pain (e.g., depression, anxiety). According to epidemiological and clinical observations, the prevalence of tension-type HA increases with age [8, 27]. Moreover, the level of depression, anxiety, and behavior problems of children suffering from migraine tends to be only slightly increased when compared with healthy controls [28–30] as opposed to the significant changes in psychological functioning typically found in adult migraine patients [31]. Despite its potential usefulness, psychophysiological reactivity in children with migraine has not yet been investigated systematically.

The purpose of this study was to examine psychophysiological responses to stress in children with migraine in comparison to nonheadache controls with the main hypothesis that children suffering from migraine exhibit significantly more cranial vasodilation and peripheral vasoconstriction in response to stress. Measures of sympathetic arousal were included to determine the specificity of the physiological responses, especially given the lack of empirical data for children suffering from migraine. Vasomotor activity was recorded peripherally and from two cranial sites. In addition to the temporal artery, vasomotor responses were also measured from the A. supraorbitalis. This second cranial site was chosen because children with migraine often locate their HA above or behind the eye. Moreover, the inclusion of a second cranial recording site allowed the evaluation of the extent (“generality”) of abnormal cranial vasomotor activity in (pediatric) migraine [32, 33]. To increase the validity of the induced stress, parent–child conflict and a standard laboratory stressor were used. Both situations can be considered as (at least potentially) individually relevant stressors because achievement situations and emotional stress are among the most frequently endorsed migraine triggers in children [8].

## METHOD

### *Subjects*

A total of 29 children suffering from recurrent migraine HA and 10 healthy controls were assessed as part of a treatment study. The control subjects were recruited among the siblings of the participating

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